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Many military installations face the problem of disposing of small quantities of petroleum hydrocarbon contaminated soils. These soils are found at facilities such as fuel storage tanks, maintenance and vehicle wash areas, and training areas where fuel has been spilled. The private sector also faces similar problems at service stations and maintenance garages.

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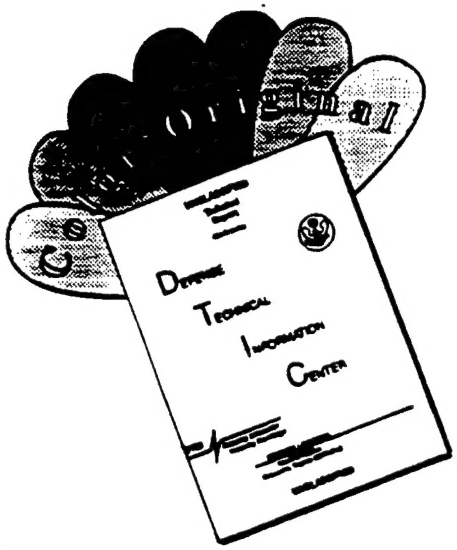

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TechData Sheet

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SERDP
Strategic Environmental Research and Development Program
Improving Mission Readiness Through Environmental Research

TDS-2017-ENV (Revised) **March 1997**

Advanced Fuel Hydrocarbon Remediation National Test Location

Biocell Treatment of Petroleum Contaminated Soils

Conducted by:

U. S. Army Corps of Engineer
Waterways Experiment Station,Vicksburg, MS

Many military installations face the problem of disposing of small quantities of petroleum hydrocarbon contaminated soils. These soils are found at facilities such as fuel storage tanks, maintenance and vehicle wash areas, and training areas where fuel has been spilled. The private sector also faces similar problems at service stations and maintenance garages.

Biocells are engineered systems that use naturally occurring microbes to degrade fuels and oils into simpler, non-hazardous, and non-toxic compounds. Biocells are able to treat soils contaminated with petroleum based fuels and lubricants, including diesel, jet fuel, and lubricating and hydraulic oils. The microbes use the contaminants as a food source and thus destroy them.

By carefully monitoring and controlling air and moisture levels, degradation rates can be increased and total treatment time reduced over natural systems.

Purpose of Demonstration

The pilot scale evaluation of the biocell system at the Naval Construction Battalion Center (CBC), Port Hueneme, California, will include optimization of moisture and aeration rates, investigation of "low tech" analytical methods, air emissions control, and improvements in ease of operation of the field scale system.

Advantages of Biocells

- Costs are low when compared to incineration or dig and haul disposal of contaminated soil.
- Protects both groundwater and air from leachate and/or fugitive emissions associated with *in situ* treatment or land farming.
- Operates without major engineering/scientific oversight.
- Contaminants are destroyed.
- Faster overall process compared to most in situ systems.

Technical Description

A combination of the best aspects of the low cost remediation technologies of landfarming and bioventing form the framework of the biocell treatment technology. Both of these technologies have been widely used in remediation, however, both have disadvantages. Bioventing, an in situ technology, does not require excavation, but also does not protect groundwater from further contamination during the remediation process. The major disadvantage of landfarming is fugitive air emissions, which are becoming more strictly regulated.

The biocell uses well known biological processes to degrade total petroleum hydrocarbons (TPH) into carbon dioxide and water. Under optimum nutrient, moisture, oxygen, pH, and temperature conditions, native bacteria in the contaminated soil use the TPH as a food source. Clean soil can then be returned to the original excavation site or used as fill where needed. Biocell treatment is similar to the concept of land farming; except the soil bed is contained and covered to prevent leaching and volatilization of TPH into the surrounding environment. Gases generated during operation on the biocell are captured in a granulated activated carbon adsorption system placed outside the biocell.

The biocell system converts commercial roll-off dumpsters into fully contained bioremediation units (see Figure 1). The conversion is performed by adding appropriate plumbing and materials for nutrient and air supply (see Figures 2 and 3). Individual units can treat up to 40 cubic yards of contaminated soil at a time, and several units may be combined at one site for larger soil volumes. The Army's Waterways Experiment Station (WES) has developed the 10 cubic yards biocell, which was tested at CBC, Port Hueneme. The biocell had additional equipment for monitoring and evaluation in the research stage of the program.

A significant part of the WES research is aimed towards simplifying the technology for the user. The intent is to develop a system using "off-the-shelf" materials, available worldwide. Simple agricultural style moisture sensors was investigated for maintaining optimal biodegradation conditions in the biocell. WES will also develop design and operation manuals and material lists for a "conversion kit" for use by Department of Defense installations.

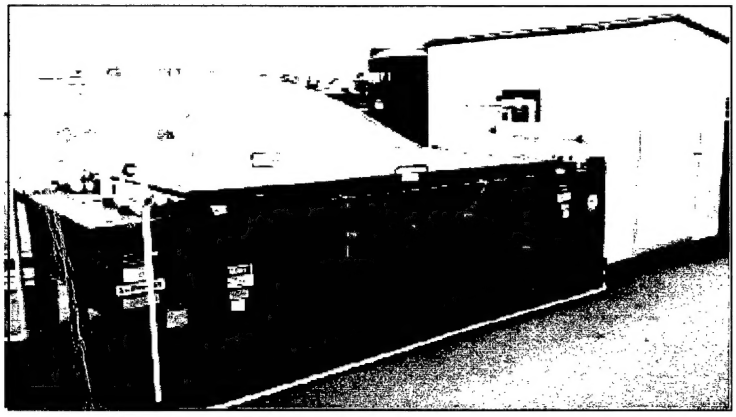

Figure 1. Sealed biocell system and control building.

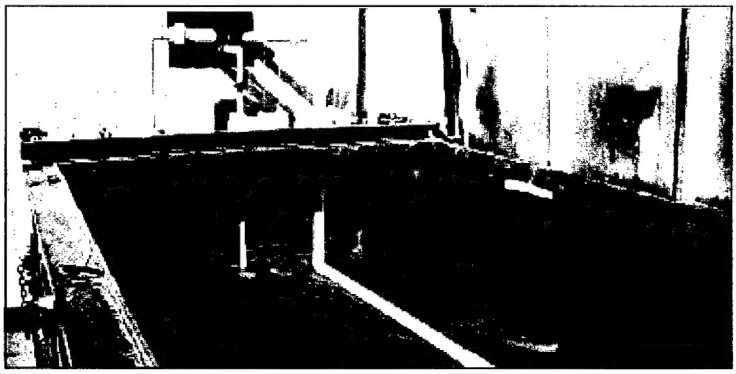

Figure 2. Air headers on geotextile layer.

Figure 3. Filled biocell system and control building.

For more information about the ***biocell system***, contact:

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